

**REMARKS**

Prior to the present amendment the application contained claims 1-60. Following the present amendment claims 11, 21, 24, 29, 34, 38-40, and 46-60 are cancelled. Claims 1, 2, 9, 10, 12, 13, 19, 20, 22, 25, 27, 30-32, 35, 36, and 41-43 have been amended by the present amendment.

Per the Examiner's request attached are the claims of application serial no. 10/036,928 and serial no. 10/037,958.

The Examiner rejected claims 1-60 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative under 35 U.S.C. § 103(a) as obvious over Edwards (US 4,721,817) alone or in view of Reichel et al. (US 6,103,850).

Rejection of a claim under 35 U.S.C. § 102(b) as being anticipated based on a cited reference requires the each and every limitation of the rejected claim be found within the cited reference or such rejection is improper and must be withdrawn. With respect to rejection of a claim under 35 U.S.C. § 103(a) maintenance of this rejection requires that there be some teaching, suggestion or motivation found within the cited references that would initially lead to their combination and furthermore that would either produce or make obvious the rejected claim. Absent such teaching, suggestion, or motivation rejection of a claim under 35 U.S.C. § 103(a) based on a combination of references is improper and must be withdrawn. The teaching, suggestion, or motivation must be found within the references themselves and not by utilizing Applicant's claimed invention in a hindsight manner.

As amended independent claim 1 is directed toward a polyether polyol formed from a C<sub>2</sub> or C<sub>3</sub> alkylene oxide or a mixture thereof and an initiator molecule wherein the polyol has an unsaturation of less than or equal to 0.015 meq/g KOH and a number average molecular weight of from 2,000 to 10,000 with no higher molecular weight polyols. Such a polyol is not disclosed in Edwards. The Examiner is directed to the examples disclosed in Edwards in column 10, lines 18-21. This section reveals that the C<sub>6</sub> to C<sub>30</sub> initiator alkanol has added onto it from 1 to about 30 alkylene oxide adduct groups. This would produce a polyol having a molecular weight of approximately 1,700 Daltons. This is outside the range required by claim 1 of the present application. In addition, there is no disclosure in Edwards of the unsaturation of the produced polyol. Finally, the catalyst described in Edwards are somewhat different of those of the present invention so it is not clear that polyols produced according to Edwards would necessarily have the same degree of low unsaturation as that found in the present invention. Because independent claim 1 includes numerous limitations not disclosed in Edwards the rejection of this claim, and the claims which depend therefrom, under 35 U.S.C. § 102(b) based on Edwards is improper and should be withdrawn.

Following the rational described above with respect to independent claim 1, Edwards also fails to disclose each and every limitation found in independent claims 12, 22, 32, 36, and 41. Each of these claims require the polyol to have an unsaturation of less than or equal to 0.015 meq/g KOH and a number average molecular weight of 2,000 to 10,000 with no higher molecular weight polyols. With respect to claim 27 Edwards also fails to disclose, as the Examiner admits, formation of a heteric polyether polyol. Because Edwards fails to disclose

numerous limitations found in each of these independent claims the rejection of these claims and the claims which depend therefrom under 35 U.S.C. § 102(b) based on Edwards is improper and should be withdrawn.

As discussed above Edwards discloses short polyols having an undetermined unsaturation level. Reichel et al. discloses polyols having lower unsaturation than was available at the time of Reichel et al. in the prior art. These lower unsaturation polyols are achieved by forming a very specific polyol structure wherein an initiator molecule is reacted with oxypropylene groups in an amount of from 25 to 80 weight percent based on the weight of all the alkylene oxide groups and the initiator in the prepolymer. The prepolymer is then reacted with oxyalkylene groups derived from a C<sub>4</sub> or higher alkylene oxide. Specifically, Reichel et al. discloses that putting terminal end caps of butylene oxide onto the polyol enables one to produce polyols having lower unsaturation. The lowest unsaturation disclosed in Reichel et al. is 0.02 meq/g KOH. All the independent claims of the present application require that the polyol be formed using only a C<sub>2</sub> or C<sub>3</sub> alkylene oxide or mixtures thereof thus excluding butylene oxide. In addition, all the independent claims require that the unsaturation be less than or equal to 0.015 meq/g KOH. Examples disclosed in Reichel et al. generally have a molecular weight of 1,500 or less. Thus when Reichel et al. is combined with Edwards one still fails to find any teaching, suggestion, or motivation for producing Applicant's invention. The polyols produced in both applications have in general much lower molecular weights than those required by the present invention, unsaturations that are outside the range of the present invention, and Reichel et al. discloses that producing lower unsaturation polyols requires the presence of butylene oxide

caps, which are excluded in the present invention. Thus, the rejection of independent claims 1, 12, 22, 27, 32, 36, and 41 under 35 U.S.C. § 103(a) and the claims which depend therefrom based on Edwards in view of Reichel et al. is improper and should be withdrawn.

The Examiner rejected claims 1-3, 6-22, 24-30, 32-35, 38-42, 46-49, 51-54, and 56-60 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, 35 U.S.C. § 103(a) as obvious over Pazos et al. (US 5,919,988).

The Examiner admits that Pazos et al. does not exemplify an ethylene oxide capped polyether polyol. Part of the reason for this is the fact that Pazos et al. utilizes a DMC catalyst and such catalysts are incapable of producing ethylene oxide capped polyols as required by some of the claims of the present invention. Pazos et al. discloses the use of a DMC catalyst in a manner such that it leads to a reduction of the typical high molecular weight polyol tail that is always found when utilizing a DMC catalyst. In fact, the entire thrust of Pazos et al. is directed toward finding ways to utilize a DMC catalyst while reducing this high molecular weight tail. Pazos et al admits and as is described in the present invention this high molecular weight tail produces a polyol mixture that is unable to be substituted for KOH polyols and which can lead to problems preparing foams from the polyol. There is no known way of removing this high molecular weight tail and it is always present in a polyol produced using a DMC catalyst.

Independent claims 1, 12, 22, 27, 32, 36, and 41 of the present invention all require that the polyol have a number average molecular weight of from 2,000 to 10,000 with no higher molecular weight polyols. This clearly excludes all the polyols of Pazos et al. which by Pazos et al. own admission all include the high molecular weight tail albeit at a reduced level

compared to previous methods of utilizing a DMC catalyst. Thus the rejection of these independent claims and all the claims that depend from them under 35 U.S.C. § 102(a) as being anticipated by Pazos et al. as being improper and must be withdrawn.

With respect to the rejections of these independent claims and the claims which depend from them under 35 U.S.C. § 103(a) based on Pazos et al. this rejection also must be withdrawn. There is not teaching, suggestion, or motivation within Pazos et al. for substituting an aluminum phosphonate catalyst in place of the DMC catalyst utilized in Pazos et al. which would allow one to produce a polyol having the required molecular weight range, the required unsaturation level, and the presence of no higher molecular weight polyols. It is simply impossible to produce such a polyol utilizing the disclosure of Pazos et al. It is only with Applicant's unique catalyst that such a polyol is capable of being produced. Thus, the rejection of these independent claims and the claims which depend from them under 35 U.S.C. § 103(a) based on Pazos et al is improper and should be withdrawn.

Finally the Examiner rejected claims 1-42 and 46-60 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, 35 U.S.C. § 103(a) as obvious over Reichel et al. As discussed above the polyols disclosed in Reichel et al. all require a butylene oxide cap in order to have unsaturations of .02 or greater. Polyols claimed in the present invention have much lower unsaturation, a much higher molecular weight, and excluded the presence of butylene oxide. Thus because independent claims 1, 12, 22, 27, 32, 36, and 41 all include limitations not disclosed in Reichel et al the rejection of these claims and the claims which depend therefrom under 35 U.S.C. § 102(b) based on Reichel et al. is improper and must be withdrawn. With

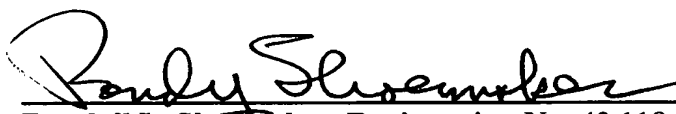
respect to the rejection of these independent claims under 35 U.S.C. § 103(a) based on Reichel et al. the Examiner is directed to the above arguments with respect to the combination of Edwards and Reichel et al. The polyols disclosed within Reichel et al. and taught by Reichel et al. as being of lower unsaturation than conventional polyols all require the presence of a butylene oxide cap. The present invention excludes butylene oxide in any portion of the polyol and there is no teaching, suggestion, or motivation found within Reichel et al. that would lead one of ordinary skill to disregard the teaching of Reichel et al. as to the necessity of a butylene oxide cap to produce low unsaturation polyols in the absence of Applicant's invention. Absent such a teaching, suggestion, or motivation it is improper to reject the rejected independent claims and the claims which depend therefrom under 35 U.S.C. § 103(a) based on Reichel et al.

Applicant's attorney respectfully submits that the claims as amended are now in condition for allowance and respectfully requests such allowance.

Respectfully submitted,

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Serial No. 10/036,928

Claims of Application Serial No. 10/036,928

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1. (Previously Amended) A composition of matter comprising:

- a) a polyurethane material and
- b) an aluminum phosphonate catalyst having the general structure of  $\text{RPO}-(\text{OAlR}'\text{R}'')_2$   
or residues of said aluminum phosphonate catalyst, wherein:  
  
P represents pentavalent phosphorous;  
  
O represents oxygen;  
  
Al represents aluminum  
  
R is one of a hydrogen, an alkyl group, or an aryl group; and  
  
R' and R'' independently are one of a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

2. (Previously Amended) The composition of matter as recited in Claim 1 wherein:

- R is a methyl group; and
- R' and R'' independently are one of an ethyl group, an ethoxy group, a propyl group, a propoxy group, a butyl group, a butoxy group, a phenyl group, or a phenoxy group.

3. (Original) The composition of matter as recited in Claim 1, wherein said aluminum phosphonate is present at levels of from approximately 0.001 to 5.0 weight percent based on the total weight of the polyurethane.



4. (Original) The composition of matter of Claim 1, wherein the polyurethane material is selected from the group consisting of flexible foams, rigid foams, coatings, adhesives, sealants, elastomers and thermoplastics.

5. (Previously Amended) A polyurethane product comprising greater than 0.001 weight percent of an aluminum phosphonate catalyst and/or residues of said aluminum phosphonate catalyst based on the total weight of the polyurethane product, said aluminum phosphonate catalyst having the general structure of  $\text{RPO}-(\text{OAlR}'\text{R}'')_2$  wherein: O represents oxygen; P represents pentavalent phosphorous; Al represents aluminum; R is one of a hydrogen, an alkyl group, or an aryl group; and R' and R'' independently are one of a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

6. (Previously Amended) The polyurethane product of claim 5 wherein:

R is a methyl group; and

R' and R'' independently are one of an ethyl group, an ethoxy group, a propyl group, a propoxy group, a butyl group, a butoxy group, a phenyl group, or a phenoxy group.

7. (Original) The polyurethane product of Claim 5, wherein the product is selected from the group consisting of flexible foams, rigid foams, coatings, adhesives, sealants, elastomers and thermoplastics.

8. (Original) A polyurethane product formed according to a process comprising the steps of:

- a) providing at least one alkylene oxide;
  - b) providing at least one initiator molecule having at least one alkylene oxide reactive hydrogen;
  - c) providing an aluminum phosphonate catalyst having the general structure of  $\text{RPO}(\text{OAlR}'\text{R}'')_2$  wherein: O represents oxygen; P represents pentavalent phosphorous; Al represents aluminum; R is one of ~~comprises~~ a hydrogen, an alkyl group, or an aryl group; and R' and R'' independently are one of ~~comprise~~ a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group;
  - d) reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of said ~~an~~ aluminum phosphonate catalyst to form a polyether polyol D) having reactive hydrogens;
  - e) providing at least one organic polyisocyanate and/or isocyanate pre-polymer E) having functional groups reactive toward said polyether polyol reactive hydrogens;
  - f) reacting E) with D), and optionally, with additional substances having reactive hydrogens, in the presence of
  - g) a urethane promoting catalyst; and
  - h) optionally, blowing agents, cross-linkers, surfactants, fillers, pigments, antioxidants and stabilizers.
9. (Previously Amended) The polyurethane product of Claim 8, wherein step c) comprises providing the aluminum phosphonate catalyst in an amount of from 0.1 to 5.0 weight percent based on the total weight of the polyether polyol of step d).

10. (Previously Amended) The polyurethane product of Claim 8, comprising providing as the aluminum phosphonate catalyst an aluminum phosphonate wherein: R is a methyl group; and R' and R'' independently are one of an ethyl group, an ethoxy group, a propyl group, a propoxy group, a butyl group, a butoxy group, a phenyl group, or a phenoxy group.

11. (Original) The polyurethane product of Claim 8, wherein the product is selected from the group consisting of flexible foams, rigid foams, coatings, adhesives, sealants, elastomers and thermoplastics.

12. (Previously Amended) A method of producing a polyurethane product comprising reacting:

- a) a polyol component comprising at least one polyoxyalkylene polyether polyol produced in the presence of an aluminum phosphonate catalyst, and having an average equivalent weight of from about 100 to about 10,000; with
- b) an organic isocyanate; and
- c) optionally, a catalyst, a blowing agent, and
- d) optionally, cross-linkers, surfactants, flame retardants, fillers, pigments, antioxidants and stabilizers;

wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}(\text{OA1R'R'})_2$  where O is oxygen, P is a pentavalent phosphorous, A1 is aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R'' are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

13. (Previously Amended) A method as recited in claim 12 wherein said polyether polyol comprises a styrene acrylonitrile graft polymer polyol dispersion and the polyurethane product comprises a flexible foam.

14. (Previously Amended) A method as recited in claim 12 wherein said polyol component comprises a mixture of at least one polyether polyol and a least one graft polymer polyol dispersion and the polyurethane product comprises a flexible foam.

15. (Original) A flexible polyurethane foam made according to the process as recited in claim 12.

16. (Original) A rigid polyurethane foam made according to the process as recited in claim 12.

17. (Original) A thermoplastic polyurethane made according to the process as recited in claim 12.

18. (Original) A polyurethane coating made according to the process as recited in claim 12.

19. (Original) A polyurethane adhesive made according to the process as recited in claim 12.

20. (Original) A polyurethane sealant made according to the process as recited in claim 12.

21. (Original) A polyurethane elastomer made according to the process as recited in claim 12.

22. (Previously Amended) A polyurethane elastomer comprising a reaction product of an organic polyisocyanate with a polyol component comprising at least one polyether polyol having an equivalent weight of at least 900 and comprising a reaction product of propylene oxide and a di-hydroxyl functionality initiator molecule in the presence of an aluminum phosphonate catalyst wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}-(\text{OA1R}'\text{R}'')_2$  where O is oxygen, P is a pentavalent phosphorous, A1 is aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R'' are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

23. (Previously Amended) A method of producing a polyurethane elastomer comprising reacting:

- a) a polyol component comprising at least one polyoxyalkylene polyether polyol produced in the presence of an aluminum phosphonate catalyst, with
- b) an organic isocyanate; and
- c) optionally, one or more chain extenders, and
- d) optionally a catalyst, a surfactant, a blowing agent, and an effective amount of an flame retardant;
- e) where the combined functionality of the polyol component (a) and any chain extenders is less than 2.3 and wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}-(\text{OA1R}'\text{R}'')_2$  where O is oxygen, P is a pentavalent phosphorous, A1 is

aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R" are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

24. (Original) A polyurethane elastomer made according to the process as recited in claim 23.

25. (Previously Amended) A method of producing a polyurethane adhesive comprising reacting:

- a) a polyol component comprising at least one polyoxyalkylene polyether polyol produced in the presence of an aluminum phosphonate catalyst, with
- b) an excess of organic isocyanate; and
- c) optionally, one or more chain extenders, and
- d) optionally a catalyst, a surfactant, a blowing agent, and an effective amount of an flame retardant and wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}-(\text{OA1R'R'})_2$  where O is oxygen, P is a pentavalent phosphorous, A1 is aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R" are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

26. (Original) A polyurethane adhesive made according to the process as recited in claim 25.

27. (Previously Amended) A method of producing a polyurethane sealant comprising reacting:

- a) a polyol component comprising at least one polyoxyalkylene polyether polyol produced in the presence of an aluminum phosphonate catalyst, with
- b) an organic isocyanate; and
- c) optionally, one or more chain extenders, and
- d) optionally a catalyst, a surfactant, a blowing agent, and an effective amount of an flame retardant

where the combined functionality of the polyol component (a) and any chain extenders is greater than 2.3 to 3.0 and wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}-(\text{OA1R}'\text{R}'')^2$  where O is oxygen, P is a pentavalent phosphorous, A1 is aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R'' are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

28. (Original) A polyurethane sealant made according to the process as recited in claim 27.

29. (Previously Amended) A method of producing a thermoplastic polyurethane article comprising reacting:

- a) compounds which are reactive toward isocyanates which comprise a polyol component comprising at least one polyoxyalkylene polyether polyol produced in the presence of an aluminum phosphonate catalyst, said polyol component having a number ~~an~~ average molecular weight of from 500 to 8000, with

- b) an organic isocyanate; and
- c) optionally, a catalyst, a blowing agent, and
- d) optionally a surfactant, a chain extender, and an effective amount of a flame retardant;

where the ratio of the isocyanate groups of the component (b) to the sum of isocyanate-reactive groups of the components (a) and, if used, said chain extender is from approximately 1:0.9 to 1:1.1 and wherein the aluminum phosphate catalyst has the general structure of  $\text{RPO}-(\text{OA1R}'\text{R}'')_2$  where O is oxygen, P is a pentavalent phosphorous, A1 is aluminum, R is one of a hydrogen, an alkyl group, or an aryl group, R' and R'' are independently a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

30. (Original) A thermoplastic polyurethane made according to the process as recited in claim 29.



Claims of Application Serial No. 10/037,958

1. (Original) A method for formation of polyetherols comprising the steps of:
  - a) providing at least one alkylene oxide;
  - b) providing at least one initiator molecule having at least one alkylene oxide reactive hydrogen; and
  - c) reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of an aluminum phosphonate catalyst to form a polyetherol.
2. (Original) The method of Claim 1, wherein step a) comprises providing ethylene oxide, propylene oxide, butylene oxide, epichlorohydrin or mixtures of these alkylene oxides.
3. (Original) The method of Claim 1, wherein step b) comprises providing as the at least one initiator molecule, an alcohol, a polyhydroxyl compound, a mixed hydroxyl and amine compound, a polyamine compound, or mixtures of these initiator molecules.
4. (Original) The method of Claim 3, wherein step b) comprises the further step of pre-reacting the initiator molecule with at least one alkylene oxide to form an oligomer and then using the oligomer as the initiator molecule in step c).
5. (Original) The method of Claim 4, comprising forming an oligomer having a number average molecular weight of from 200 to 1500 Daltons.

6. (Original) The method of Claim 1, wherein step c) comprises providing the aluminum phosphonate catalyst in an amount of from 0.1 to 5.0 weight percent based on the total weight of the polyetherol.

7. (Original) The method of Claim 1, wherein step c) comprises providing as the aluminum phosphonate catalyst an aluminum phosphonate having the general structure of  $\text{RPO}-(\text{OAlR}'\text{R}'')_2$  wherein: O represents oxygen; P represents pentavalent phosphorous; Al represents aluminum; R comprises a hydrogen, a methyl group, an alkyl group, or an aryl group; and R' and R'' independently comprise a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group.

8. (Original) The method of Claim 7, comprising providing as the aluminum phosphonate catalyst an aluminum phosphonate wherein: R is a methyl group; and R' and R'' independently comprise one of an ethyl group, an ethoxy group, a propyl group, a propoxy group, a butyl group, a butoxy group, a phenyl group, or a phenoxy group.

9. (Original) The method of Claim 1, wherein step c) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst to form a polyetherol having an unsaturation of less than or equal to 0.020 meq/g KOH

10. (Original) The method of Claim 1, wherein step c) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst to form a polyetherol having an unsaturation of less than or equal to 0.015 meq/g KOH.

11. (Original) The method as recited in Claim 1, wherein step c) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst for a period of time from 15 minutes to 15 hours.

12. (Original) The method as recited in Claim 1, wherein step c) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst for a period of time sufficient to produce a polyetherol having a number average molecular weight of from 1500 to 8000 Daltons.

13. (Original) The method as recited in Claim 1, wherein step c) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst at a temperature of from 95° to 150°C.

14. (Original) The method as recited in Claim 1, wherein step c) further comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst at a temperature of from 105° to 130°C.

15. (Original) A method for formation of polyetherols comprising the steps of:
- a) providing at least one alkylene oxide;
  - b) providing at least one initiator molecule having at least two alkylene oxide reactive hydrogens;
  - c) providing an aluminum phosphonate catalyst having the general structure of  $\text{RPO}-(\text{OAlR}'\text{R}'')_2$  wherein: O represents oxygen; P represents pentavalent phosphorous; Al represents aluminum; R comprises a hydrogen, a methyl group, an alkyl group, or an aryl group; and R' and R'' independently comprise a halide, an alkyl group, an alkoxy group, an aryl group, or an aryloxy group; and
  - d) reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst to form a polyetherol.
16. (Original) The method of Claim 15, wherein step a) further comprises providing ethylene oxide, propylene oxide, butylene oxide, epichlorohydrin or mixtures of these alkylene oxides.
17. (Original) The method of Claim 15, wherein step b) comprises providing as the at least one initiator molecule a polyhydroxyl compound, a mixed hydroxyl and amine compound, a polyamine compound, or mixtures of these initiator molecules.
18. (Original) The method of Claim 15, wherein step b) comprises the further step of pre-reacting the initiator molecule with at least one alkylene oxide to form an oligomer and then using the oligomer as the initiator molecule in step d).

19. (Original) The method of Claim 18, comprising forming an oligomer having a number average molecular weight of from 200 to 1500 Daltons.

20. (Original) The method of Claim 15, wherein step c) comprises providing the aluminum phosphonate catalyst in an amount of from 0.1 to 5.0 weight percent based on the total weight of the polyetherol.

21. (Original) The method of Claim 15, wherein step c) comprises providing as the aluminum phosphonate catalyst an aluminum phosphonate wherein: R is a methyl group; and R' and R'' independently comprise one of an ethyl group, an ethoxy group, a propyl group, a propoxy group, a butyl group, a butoxy group, a phenyl group, or a phenoxy group.

22. (Original) The method of Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst to form a polyetherol having an unsaturation of less than or equal to 0.020 meq/g KOH

23. (Original) The method of Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst to form a polyetherol having an unsaturation of less than or equal to 0.015 meq/g KOH.

24. (Original) The method as recited in Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst for a period of time from 15 minutes to 15 hours.

25. (Original) The method as recited in Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst for a period of time sufficient to produce a polyetherol having a number average molecular weight of from 1500 to 8000 Daltons.

26. (Original) The method as recited in Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst at a temperature of from 95° to 150°C.

27. (Original) The method as recited in Claim 15, wherein step d) comprises reacting the at least one alkylene oxide with the at least one initiator molecule in the presence of the aluminum phosphonate catalyst at a temperature of from 105° to 130°C.

28. (Original) A method for formation of polyetherols comprising the steps of:

- a) providing propylene oxide;
- b) providing at least one initiator molecule having at least one propylene oxide reactive hydrogen; and

c) reacting the propylene oxide with the at least one initiator molecule in the presence of an aluminum phosphonate catalyst to form a polyetherol.

29. (Original) The method of Claim 28 comprising the further step of reacting the polyetherol formed in step c) with ethylene oxide in the presence of an aluminum phosphonate catalyst to thereby form terminal caps of ethylene oxide.

30. (Original) The method of Claim 29 comprising forming the terminal caps of ethylene oxide in an amount of from 5 to 80% by weight based on the total weight of the polyetherol.

31. (Original) The method of Claim 28 wherein step b) comprises providing at least one diol initiator molecule having at least two propylene oxide reactive hydrogens.

32. (Original) A method for formation of heteric polyetherols comprising the steps of:

- a) providing a mixture of alkylene oxides;
- b) providing at least one initiator molecule having at least one alkylene oxide reactive hydrogen; and
- c) reacting the mixture of alkylene oxides with the at least one initiator molecule in the presence of an aluminum phosphonate catalyst to form a heteric polyetherol.

33. (Original) The method of Claim 32 comprising the further step of reacting the heteric polyetherol formed in step c) with ethylene oxide in the presence of an aluminum phosphonate catalyst to thereby form terminal caps of ethylene oxide.

34. (Original) The method of Claim 33 comprising forming the terminal caps of ethylene oxide in an amount of from 5 to 20% by weight based on the total weight of the polyetherol.

35. (Original) The method of Claim 32 comprising the further step of reacting the heteric polyetherol formed in step c) with propylene oxide in the presence of an aluminum phosphonate catalyst to thereby form terminal caps of propylene oxide.

36. (Original) The method of Claim 35 comprising forming the terminal caps of propylene oxide in an amount of from 5 to 15% by weight based on the total weight of the polyetherol.

37. (Original) A method for formation of polyetherols comprising the steps of:

- a) providing ethylene oxide;
- b) providing at least one initiator molecule having at least one ethylene oxide reactive hydrogen; and
- c) reacting the ethylene oxide with the at least one initiator molecule in the presence of an aluminum phosphonate catalyst to form a polyetherol.



38. (Original) The method of Claim 37 comprising the further step of reacting the polyetherol formed in step c) with propylene oxide in the presence of an aluminum phosphonate catalyst to thereby form terminal caps of propylene oxide.

39. (Original) The method of Claim 38 comprising forming the terminal caps of propylene oxide in an amount of from 5 to 80% by weight based on the total weight of the polyetherol.

40. (Original) A method for formation of polyetherols comprising the steps of:

- a) providing at least one alkylene oxide;
- b) providing at least one oligomer having at least one alkylene oxide reactive hydrogen; and
- c) reacting the at least one alkylene oxide with the at least one oligomer in the presence of an aluminum phosphonate catalyst to form a polyetherol.

41. (Original) The method of Claim 40 comprising providing at least one oligomer having a number average molecular weight of from 200 to 1500 Daltons.

42. (Original) A method for terminal cap modification of polyetherols comprising the steps of:

- a) providing a polyetherol; and

c) reacting the polyetherol with at least one alkylene oxide in the presence of an aluminum phosphonate catalyst to form a modified polyetherol having terminal caps comprising the alkylene oxide.

43. (Original) The method of Claim 42 comprising reacting the polyetherol with ethylene oxide, propylene oxide, epichlorohydrin, or mixtures of these alkylene oxides to form the modified polyetherol.

44. (Original) The method of Claim 42 comprising providing a polyetherol having a number average molecular weight of from 500 to 10,000 Daltons in step a).

45. (Original) A method for formation of linear block copolymer polyetherols comprising the steps of:

- a) providing a first alkylene oxide;
- b) providing at least one diol initiator molecule having two alkylene oxide reactive hydrogens; and
- c) reacting the first alkylene oxide with the at least one diol initiator molecule in the presence of an aluminum phosphonate catalyst to form a linear polyetherol; and
- d) reacting the reaction product of step c) with a second alkylene oxide other than the first alkylene oxide in the presence of the aluminum phosphonate catalyst to form a linear block copolymer polyetherol.

46. (Original) The method of claim 45, wherein the first alkylene oxide is one of propylene oxide or ethylene oxide and the second alkylene oxide is the other of propylene oxide or ethylene oxide.

47. (Original) The method of claim 45, wherein the first alkylene oxide is one of propylene oxide or butylene oxide and the second alkylene oxide is the other of propylene oxide or butylene oxide.

48. (Original) The method of claim 45, wherein the first alkylene oxide is one of ethylene oxide or butylene oxide and the second alkylene oxide is the other of ethylene oxide or butylene oxide.